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Fleer, J; Hoekstra, HJ; Sleijfer, DT; Tuinman, MA; Klip, EC; Hoekstra-Weebers, JEHM

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J. Fleer
H. J. Hoekstra
D. T. Sleijfer
M. A. Tuinman
E. C. Klip
J. E. H. M. Hoekstra-Weebers

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J. Fleer · H. J. Hoekstra (✉) ·
M. A. Tuinman
Department of Surgical Oncology,
University of Groningen and University
Medical Center Groningen,
P.O. Box 30.001,
9700 RB Groningen, The Netherlands
e-mail: h.j.hoekstra@chir.umcg.nl
Tel.: +31-50-3612303
Fax: +31-50-3614873

D. T. Sleijfer
Department of Medical Oncology,
University of Groningen and University
Medical Center Groningen,
Groningen, The Netherlands

E. C. Klip ·
J. E. H. M. Hoekstra-Weebers
Department of Health Psychology,
University of Groningen and University
Medical Center Groningen,
Groningen, The Netherlands

J. E. H. M. Hoekstra-Weebers
Comprehensive Cancer Center
North-Netherlands,
Groningen, The Netherlands

Abstract *Goals of work:* The aim of this study was to (1) assess the quality of life (QoL) of testicular cancer survivors (TCSs) by comparing them to a reference group; (2) investigate the relationship between the QoL of TCSs and sociodemographics, cancer-related variables, and life events; and (3) identify TCSs at risk for an impaired QoL. *Patients and methods:* Of the TCSs approached, 50% (n=354) participated and completed a generic QoL questionnaire (RAND-36) once. Time since completion of treatment varied from 3 months to 24 years. *Main results:* (1) TCSs had significantly higher mean scores on the subscales physical functioning (p=0.02) and pain (p=0.001), but lower mean scores on mental health (p=0.04) and vitality (p<0.001) than a reference group of men. The effect sizes of these differences were small to insignificant. (2) Employment status and chronic disease were the main correlates of the QoL of TCSs. Age, negative life events, type of treatment, and the experience of a second cancer event were moderately associated with some subscales as well. (3) The joint burden of unemployment and a chronic disease was the strongest predictor for an impaired functioning. *Conclusions:* On a group level, TCSs experience a good QoL, but a small group appeared to be at risk for an impaired functioning, namely, those who were unemployed and had a chronic disease. The variance explained by the variables studied was low, indicating that more important predictors remain to be identified.

Keywords Testicular cancer survivors · Quality of life · Sociodemographics · Cancer-related variables · Life events

Introduction

Testicular cancer (TC) affects men in a period of life when intimate relationships, starting a family, and career are major concerns. Since the introduction of cisplatin-based chemotherapy in the late 1970s, TC has become one of the most curable malignancies, with cure rates between 85 and 90% [4, 8]. As a consequence, the majority of men diagnosed with TC will live the largest part of their lives as cancer survivors, and they may have to face sequel of diagnosis and treatment on different domains of their lives. The term "quality of life" (QoL) is generally used to refer to an individual's perception of his well-being on, among others, the physical, psychological, and social domains

[31]. In the research on testicular cancer survivors (TCSs), these domains already have received attention. For example, research on the physical domain shows that TCSs who were treated for metastatic disease have an increased risk of infertility, fatigue, second primary malignancies, decreased renal functioning, hearing deficits, and cardiovascular disease [20, 28]. Studies that focused on the psychological and social domains showed that the majority of TCSs experiences good levels of functioning, although subsamples report psychosocial problems such as anxiety, depression, fertility distress, and work-related problems [11].

However, a review of the literature on the QoL of TCSs revealed that most of the existing literature on the QoL of TCSs suffers from methodological shortcomings, such as small sample sizes and the use of nonvalidated questionnaires [11]. Furthermore, there is a lack of research into the QoL of the growing group of long-term TCSs. Currently, there are only a few studies that did include long-term survivors [1, 6, 13, 18], whereas at this point in time, approximately 25 years after the medical breakthrough in treatment, the group of long-term survivors has grown large enough to provide adequate statistical power to examine their QoL. Then again, the inclusion of long-term survivors does confront researchers with specific methodological concerns. In long-term survivors, it is more difficult to distinguish effects caused by cancer and its treatment, from those attributable to other factors, such as aging, comorbidities [15], and additionally experienced life events. The probability of having a functional limitation or chronic disease increases with advancing age [15], and this may affect QoL. In addition, it is likely that, over time, other life events may influence the current QoL more than the experience with cancer. Therefore, to be able to draw reliable conclusions about the QoL of TCSs, it is essential to investigate the impact of age, comorbidities, and recently experienced life events as well as that of cancer related variables. Lastly, based on the available data, it is not possible to identify TCSs at risk for an impaired QoL. Because the endpoint of research should always be to bridge the gap with clinical practice [9], the identification of risk groups should be a primary focus of QoL studies. Risk profiles may help clinicians to detect distressed TCSs in an early stage. This may lead to earlier referral to psychosocial services and, as a consequence, more patients may be spared from protracted distress [26].

The present study aims to attack the above-mentioned issues by (1) examining the QoL of a large sample of TCSs by comparing them to a reference group of Dutch men; (2) investigating the relationship of sociodemographics, cancer-related variables, and recently experienced life events with QoL and (3) identifying TCSs with an impaired QoL, based on sociodemographic variables, cancer-related variables, and recently experienced life events.

Patients and methods

Procedure

All men treated for TC between 1977 and 2003 at the University Medical Center Groningen (UMCG) in The Netherlands were approached in writing for the present study. In 1977, cisplatin-based chemotherapy, which led to the improved survival rates, was introduced into the treatment of metastic TC at the UMCG. Exclusion criteria were age younger than 18 years at study entry, insufficient command of the Dutch language, and time since completion of treatment shorter than 3 months. The decision to use the criterion of 3 months after completion of the last treatment was based on the clinical consideration that TC patients have a very good prognosis. A letter with information about the objectives of the study and an informed consent form were sent to the 702 eligible TCSs. The study was approved of by the Medical Ethics Committee of the UMCG.

Measurements

Data on the following sociodemographic variables were collected: age, educational level, marital status, employment status, and chronic disease. Highest educational level completed was measured on a seven-point scale: primary school (1), lower vocational degree (2), lower secondary (3), middle secondary (4), high secondary (5), higher vocational (6), and university (7). We define chronic disease as an illness marked by long duration or frequent recurrence and used two questions to measure the prevalence of a chronic disease. TCSs first responded to a yes/no question: "Do you have a chronic disease (e.g., asthma, multiple sclerosis, rheumatoid arthritis)?" If a TCS reported that he had a chronic disease, he was asked to describe the disease.

In addition, the following cancer-related data were collected: age at diagnosis, time since completion of treatment, type of treatment, and whether they had experienced a second cancer event (either a tumor relapse or a second primary malignancy). Type of treatment could comprise orchiectomy (surgical removal of the affected testicle), orchiectomy, and a retroperitoneal lymph node dissection (RPLND), orchiectomy and radiotherapy, orchiectomy and chemotherapy, or orchiectomy and chemotherapy, and resection of residual tumor mass (RRTM).

The RAND-36 [17] is an internationally used valid and reliable generic self-report questionnaire to assess QoL. The Dutch version of the RAND-36 [30] was used. It contains eight subscales: physical functioning (ten items), social functioning (two items), role limitations in work or other activities due to physical problems (four items), role limitations in work or other activities due to emotional problems (three items), mental health (five items), vitality (two items), pain (two items), and general health perception

(five items). After recoding and transforming, scores of the subscales could range from 0 to 100, with a higher score indicating better functioning. In the present study, internal consistency (Cronbach alpha) of the subscales for the total group of TCSs varied between 0.80 and 0.92.

We used reference scores from the Dutch manual for the RAND-36 as comparison to the TCSs. These comprised the mean scores from a group of 372 nonselected men from a random sample of 1,063 persons aged 18 years and older from the population register of a municipality in the north of the Netherlands (number of inhabitants=108,000). The mean age of the persons in the total random sample was 44.1 years (range 18–89 years) [30].

Life events were measured with the Vragenlijst Recent Meegemaakte Gebeurtenissen (VRMG), a Dutch questionnaire to measure recently experienced life events [29]. This questionnaire contains 25 events around five themes: health, illness and death, pregnancy/birth, work, relationships, and miscellaneous (e.g., financial gain/loss, moving house, passing an exam). TCSs were asked to report whether they had experienced any of the 11 positive events and 14 negative events during the past year. Sum scores were calculated for the two subscales.

For TCSs, one self-constructed question was added to relate their experience with TC to their current QoL. TCSs responded to the question: "Do you think that your experience with TC affects your current QoL?" The following answers could be given: (1) "TC affects my current QoL very negatively", (2) "TC affects my current QoL negatively", (3) "TC affects my current QoL positively as well as negatively", (4) "TC affects my current QoL positively", (5) "TC affects my current QoL very positively", (6) "TC does not affect my current QoL".

Statistical analyses

To investigate differences between the TCSs and the reference group, independent *t* tests were performed. Effect sizes were calculated with Cohen's d to assess the clinical significance of differences between TCSs and the reference group on the RAND-36. The interpretation of effect sizes is that a difference greater than 0.8 is large, between 0.5 and 0.8 is moderate, between 0.2 and 0.5 is small, and a difference smaller than 0.2 is insignificant [7].

Pearson correlations, *t* tests, ANOVAs, and Mann–Whitney tests were conducted to examine which sociodemographic variables, life events, and cancer-related variables were significantly related to the RAND-36 subscales. For employment status, a dichotomous variable was created with the categories "not employed for wages" (consisting of students, being unemployed, being unable to work and being retired) and "employed for wages" (consisting of being employed for wages). The effect of time since completion of treatment was evaluated in two ways. First, correlational analyses were performed, and secondly, ANOVAs were conducted to compare survivors divided into five groups according to time elapsed since completion of treatment. Group I, 3 months–2 years; group II, 2–5 years; group III, 5–10 years; group IV: , 10–15 years; group V, more than 15 years. The effect of type of treatment was investigated on the basis of two classifications. Firstly, the four treatment groups were compared. Secondly, two treatment groups were compared: "surgical treatment" (consisting of the categories orchiectomy and orchiectomy plus RPLND) and "combined treatment" (consisting of the categories orchiectomy plus radiotherapy, orchiectomy plus chemotherapy, and orchiectomy plus chemotherapy plus RRTM). The variables that were significantly related to the dependent variables in the univariate analyses were included in forward regression analyses.

Results were considered statistically significant if the probability of occurrence was 0.05 or less. Inasmuch as this is a descriptive study, no formal adjustments were employed to correct for multiple testing. Therefore, caution is warranted in interpretation of findings of $p>0.01$.

Results

Descriptives

Fifty percent ($n=354$) of the TCSs approached agreed to participate. Of the TCSs who did not participate, 74 (21%) indicated their reason for refusal. Main reasons mentioned were lack of interest, the disease period was considered to be a closed book, and too much of a burden. Nonparticipants did not differ significantly on age, time since diagnosis, and type of treatment from the participants.

The descriptives of the participants are summarized in Table 1. Mean age was 43.7 years, ranging from 18 to 78 years. Highest educational level completed varied from primary school to university degree, but the mean educational level was high secondary education. Furthermore, most survivors were married or cohabiting (85%), employed for wages (78%), and did not have a chronic disease (85%). The TCSs who did have a chronic disease mainly reported having rheumatoid and degenerative diseases (26%), pulmonary diseases (23%), and cardiovascular diseases (19%). Noticeable, only one TCS reported that his lungs were damaged due to treatment with bleomycin.

The mean time since completion of treatment was 10 years, ranging from 3 months to 24 years. Because age at diagnosis correlated highly with age ($r=0.83$, $p<0.001$), it was decided to leave age at diagnosis out of further analyses. The correlation between age and time since completion of treatment was lower ($r=0.43$, $p=0.001$), and therefore, both variables were taken into account in further analyses. The minority of TCSs (34.5%) was treated with surgical treatment (orchiectomy±RPLND) and almost 9% of the survivors had experienced a new cancer event (recurrence, second TC, or other cancer tumor) (Table 1).

Table 1 Sample characteristics

	TCSs (*N*=354*)	
Age (years; mean, range)	43.7	18.4–78.5
Educational level (mean, SD)[a]	4.2	1.7
Marital status (*N*, %)		
Single/divorced/separated	53	15.0
Married/cohabiting/LAT	300	85.0
Employment status (*N*, %)		
Employed for wages	275	77.9
Student	12	3.4
Out of work	6	1.7
(Partly) unable to work	28	7.9
Retired	32	9.1
Children (*N*, %)		
No	127	36.0
Yes	226	64.0
Chronic disease (*N*, %)		
No	299	84.9
Yes	53	15.1
Life events (mean, SD)		
Positive	1.6	2.0
Negative	1.3	1.6
Time since treatment (years; mean, SD)	10.0	6.7
Treatment		
Surgical treatment	121	34.5
Orchiectomy	99	28.2
Orchiectomy+RPLND	22	6.3
Combined treatment	230	65.6
Orchiectomy+radiotherapy	68	19.4
Orchiectomy+chemotherapy	53	15.1
Orchiectomy+chemotherapy+RRTM	109	31.1
Second cancer event (N, %)		
Yes	31	8.8
No	322	91.2

[a]Educational level was measured on a seven-point scale, ranging from primary school (1) to university degree (7)
RPLND Retroperitoneal lymph node dissection, *RRTM* resection of residual tumor mass, *LAT* living apart together

QoL of TCSs: comparison with a reference group

Independent *t* tests showed that TCSs reported better physical functioning (t=2.4, p<0.05) and less pain (t=3.3, p=0.001) than the reference group of men, but a worse mental health (t=−2.03, p<0.05) and less vitality (t=−3.5, p<0.001). However, the effect sizes of the differences were small for the subscales vitality and pain and insignificant for the other subscales. This indicates that the statistically significant differences are not clinically relevant (Table 2).

Associations between sociodemographic and cancer related variables and life events QoL of TCSs

A significant negative correlation was found between age and physical functioning, pain, and general health perception (all p<0.001). Furthermore, a significant positive relationship was found between educational level and physical functioning (p<0.001). Positive life events were not significantly correlated to any of the RAND-36 subscales, but a significant negative association was found between the experience of more negative life events and social functioning (p<0.05), role limitations (emotional) (p<0.01), and mental health (p<0.05). Time since treatment correlated significantly negatively with physical functioning (p<0.05) (Table 3). When TCSs were divided in time-cohorts based on time since treatment, it appeared that no significant differences were found between the cohorts on any of the RAND-36 subscales.

Married TCSs reported significantly better mental health (t=−2.23, p<0.05). TCSs who were employed for wages reported significantly better physical functioning (t=−4.42, p<0.001), social functioning (t=−3.46, p=0.001), fewer role limitations due to physical problems (t=−2.86, p<0.01), better mental health (t=−3.28, p=0.001), more vitality (t=−3.60, p<0.001), less pain (t=−3.53, p=0.001), and a better general health perception (t=−5.09, p<0.001) than did those who were not employed for wages. TCSs without a chronic disease had significantly higher mean scores on the subscales physical functioning (t=−3.78, p<0.001), social functioning (t=−3.00, p<0.05), role limitations due to

Table 2 Means and standard deviations for the RAND-36 subscales for TCSs and the reference group and *t* tests between the two groups

	TCSs		Reference group		*t*	*p* value	Effect size
	Mean	SD	Mean	SD			
Physical functioning	88	19	85	22	2.41	0.02	0.18
Social functioning	86	20	88	20	−1.84	0.07	−0.14
Role limitations (physical)	84	31	82	34	1.05	0.29	0.08
Role limitations (emotional)	85	31	87	29	−0.85	0.40	−0.06
Mental health	77	16	79	17	−2.03	0.04	−0.15
Vitality	64	20	70	21	−3.50	<0.001	−0.26
Pain	88	19	83	24	3.28	0.001	0.24
General health perception	71	20	71	23	−0.02	0.95	0.00

Table 3 Pearson correlations between continuous sociodemographic variables, life events, and cancer-related variables with the RAND-36 subscales

Variable	Age	Educational level	Positive life events	Negative life events	Time since treatment
	(*r*)	(*r*)	(*r*)	(*r*)	(*r*)
Physical functioning	−0.29**	0.20**	0.10	−0.06	−0.12
Social functioning	−0.06	0.01	0.03	−0.12	−0.02
Role limitations (physical)	−0.12	0.08	−0.02	−0.08	0.05
Role limitations (emotional)	−0.002	−0.07	−0.006	−0.15*	−0.01
Mental health	0.009	−0.02	0.01	−0.14	0.01
Vitality	−0.05	0.03	0.07	−0.09	0.004
Pain	−0.25**	0.09	0.08	−0.05	−0.09
General health perception	−0.19**	0.08	0.08	−0.08	−0.02

*$p \leq 0.01$; **$p \leq 0.001$

physical problems ($t=-2.49$, $p<0.05$), role limitations due to emotional problems ($t=-2.07$, $p<0.05$), mental health ($t=-2.60$, $p<0.05$), vitality ($t=-2.74$, $p<0.01$), pain ($t=-2.74$, $p<0.01$), and general health perception ($t=-5.18$, $p<0.001$) than did those with a chronic disease.

ANOVAs with type of treatment in four cohorts did not show significant effects of type of treatment received on any of the QoL subscales (results not reported in table). However, when type of treatment was divided in two cohorts, results showed that TCSs who had received combined treatment had significantly lower mean scores on vitality ($t=2.00$, $p<0.05$) and general health perception ($t=2.55$, $p=0.01$) than those who had received surgical treatment only. Finally, TCSs who had experienced a second cancer event reported worse mental health ($t=-2.12$, $p<0.01$) and general health perception ($t=-3.14$, $p<0.01$) than TCSs who had not experienced a second cancer event (Table 4).

Univariate analyses showed that both employment status and chronic disease significantly related to all QoL subscales, except for role limitations due to emotional problems. Because not being employed for wages may be a result of having a chronic disease, it was decided to create a composite variable, which resulted in the following groups:

Group 1, not employed for wages and with a chronic disease ($n=24$);
Group 2, employed for wages and with a chronic disease ($n=29$);
Group 3, not employed for wages and without a chronic disease ($n=54$);
Group 4, employed for wages and without a chronic disease ($n=245$).

ANOVA, followed by a Scheffé-test, showed that group 1 differed significantly from the remaining three groups on

Table 4 Means and standard deviations on the RAND-36 subscales for groups on categorical sociodemographic and cancer-related variables

Variable	Partner		Employed for wages		Chronic disease		Type of treatment		Second cancer event	
	Yes	No	Yes	No	Yes	No	Surgical	Combined	Yes	No
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Physical functioning	89 (19)	86 (20)	91 (16)	78 (26)**	75 (28)	90 (16)**	89 (19)	88 (19)	84 (19)	89 (19)
Social functioning	86 (20)	83 (19)	88 (18)	78 (25)**	76 (28)	88 (18)*	87 (20)	85 (20)	84 (22)	86 (20)
Role limitations (physical)	85 (30)	80 (32)	87 (27)	73 (39)*	72 (40)	86 (28)	87 (27)	82 (32)	80 (32)	84 (31)
Role limitations (emotional)	86 (32)	82 (31)	87 (29)	80 (37)	75 (40)	87 (29)*	84 (31)	86 (31)	83 (29)	86 (31)
Mental health	78 (16)	72 (16)	79 (14)	71 (20)**	70 (21)	78 (15)	78 (16)	77 (16)	70 (20)	78 (15)
Vitality	65 (19)	60 (20)	66 (18)	57 (22)**	57 (22)	66 (19)*	68 (19)	62 (19)	60 (21)	65 (19)
Pain	89 (19)	86 (19)	91 (17)	81 (23)**	80 (25)	90 (17)*	89 (17)	88 (20)	86 (20)	88 (19)
General health perception	72 (20)	70 (19)	74 (18)	61 (21)**	57 (22)	74 (18)**	75 (18)	69 (20)*	61 (22)	72 (19)*

*$p \leq 0.01$; **$p \leq 0.001$ significance level of differences between groups

physical functioning (F=20.41, p<0.001), social functioning (F=11.62, p<0.001), role limitations due to physical problems (F=9.78, p<0.001), pain (F=9.50, p<0.001), and general health perception (F=20.02, p<0.001). Group 1 differed significantly from group 4 on mental health (F=7.96, p<0.001) and vitality (F=6.62, p<0.001). Therefore, a dummy variable of this composite variable was created for which group 1 was separated from the remaining three groups (dummy variable, 0=TCSs who were not employed for wages and had a chronic disease; 1=the rest). This dummy variable was included in the forward regression analyses instead of the individual variables of employment status and chronic disease for all subscales, except for role limitations due to emotional problems.

Predictors of QoL

Because the third aim of this study was to identify TCSs with an impaired QoL, regression analyses were performed to determine which variables had the strongest predictive power. Only the variables that were significantly related to the dependent variables in the univariate analyses were included in the forward regression analyses. The dummy variable of employment status and chronic disease appeared to be the strongest predictor, indicating that the combination of not being employed for wages and having a chronic disease had a particularly negative effect on the QoL of TCSs. Age and educational level had significant independent predictive power in physical functioning, age had also an independent effect on pain and general health perception. The experience of negative life events had a unique negative effect on social functioning, role limitations (emotional), and mental health. With respect to cancer-related variables, type of treatment appeared to have some explanatory power in vitality and general health perception and the experience of a second cancer event in mental health and general health perception (Table 5). The univariate effects of marital status and time since completion of treatment disappeared in the regression analyses.

The selected variables in the regression models explained significant, although small, proportions of the variance of the subscales of the RAND-36 (ranging from 4 to 22%).

Evaluation of the impact of TC on current QoL

As a response to the question "Do you think that the experience with TC affects your current QoL?", 52.6% of the TCSs reported that it had a negative as well as a positive impact on their current QoL. A small percentage (11.2%) of the TCSs reported that the experience with TC still had a negative or very negative impact, 26.6% reported that it had a (very) positive impact, and 9.5% reported that it had no impact at all. TCSs who were not employed for wages and who had a chronic disease differed from the rest of the TCSs in their answers to this question: a significantly larger proportion of this group reported that TC still had a negative impact on their present QoL (33.3 vs. 9.7%, χ^2=12.90, p=0.005).

Table 5 Forward regression analyses of sociodemographics, cancer-related variables, and life events on the RAND-36 subscales

Predictor variable	Physical functioning	Social functioning	Role limitations (physical)	Role limitations (emotional)	Mental health	Vitality	Pain	General health perception
	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta
Age	−0.21**		−0.05				−0.20**	−0.12
Education level	0.17**							
Marital status					0.10			
Employment status+ chronic disease[a]	0.31**	0.30**	0.28**		0.22**	0.20**	0.20**	0.29**
Chronic disease[b]				0.14*				
Negative life events		−0.13		−0.16*	−0.14*			
Time since treatment	−0.01							
Type of treatment[c]						−0.12		−0.11
Second cancer event[d]					0.12			0.11
R^2	0.22**	0.10**	0.08**	0.04**	0.08**	0.07**	0.10**	0.16**

Empty cell, relationship was not significant in the univariate analyses
*p≤0.01; **p≤0.001
[a]0=not employed for wages+ chronic disease, 1=rest
[b]0=yes, 1=no
[c]0=surgical, 1=combined
[d]0=yes, 1=no

Discussion

Examination of the QoL of TCSs was the first objective of this study. Overall, the TCSs in our study reported relatively high levels of QoL. However, some statistically significant differences between TCSs and reference men were found. TCSs reported a better physical functioning and less bodily pain, but worse mental functioning and less vitality. Yet, the effect sizes of the statistical differences were small to negligible. These results are consistent with those of other studies reporting no differences between TCSs and controls in QoL [18, 24] and more generally consistent with the results of studies on other types of cancers [2, 14, 23]. Parker et al. [23] explained this lack of difference by arguing that "patients may be taking their cancer diagnosis in consideration when they subjectively evaluate their health status and functioning". Indeed, it may very well be that the experience with cancer changes their expectations about life or internal standards and causes one to evaluate ones QoL according to new expectations or different standards [27].

Secondly, we were interested in the relationship between the QoL of TCSs and sociodemographics, cancer-related variables, and life events. Consistent with findings in the general population [30], our results showed an aging effect in the physical domain, with older TCSs reporting a decline in functioning. We also expected to find more QoL problems in TCSs who were more recently treated. Contrary to our expectations, we did not find an effect of time since treatment. QoL of TCSs was comparable among the short-, median-, and long-term survivors, indicating that survivors quickly adapt to the circumstances created by the experience of cancer treatment.

Employment status and chronic disease were found to be the most important predictors of QoL of TCSs. More precisely, the combination of employment status and chronic disease appeared to be the strongest predictor. The mean scores of the group of unemployed TCSs with a chronic disease deviated significantly from those of men who only had a chronic disease, were only unemployed, or who neither suffered from a chronic disease or unemployment. This joint burden of unemployment and chronic disease on QoL has not been studied before in TCSs, but its negative effect on well-being has been found in the general population [21]. The relationship between these two variables is understandable when it is considered that chronic diseases can cause impairments in social activities and work, which may lead to lower levels of QoL [16, 22, 25, 32]. If and how the experience with TC relates to these findings cannot be determined on the basis of the available data, but responses to an open question indicate that unemployed TCSs with a chronic disease significantly more often experience a negative impact of TC on their current QoL than their counterparts. So, it might be that the experience with TC has impacted through chronic disease and employment status on the well-being of these men, but prospective research is needed to verify this result.

Having or not having a partner did not affect functioning in TCSs, whereas having a partner has been identified as a predictor of better well-being in the general population [23]. One line of reasoning to explain this result might be that TCSs without a partner may attribute their being single to the experience with TC ("external attribution") [10] and this might have led to a reevaluation of having a partner as being less important for their well-being than, for example, being employed. More research is needed to determine if this is the case.

TCSs who were treated with combined treatment reported less vitality and a worse general health perception than those who had received surgery only. Furthermore, TCSs who had received treatment for a second cancer event reported a worse mental health and a worse general health perception than those who did not encounter a second cancer event. Although these relationships make sense, the impact of these variables was low. This lack of effect of objective illness-related variables on QoL has been reported previously [3, 23]. It may be that the subjective perception of the seriousness or threat of the disease is a more important determinant of QoL [33].

The impact of positive life events was an insignificant predictor, but the experience of more negative life events during the past year was related to more limitations in emotional and social well-being. This is consistent with the general assumption that exposure to a cumulative number of negative life events is associated with more psychosocial problems [12]. Recently experienced negative life events influenced the current QoL of the TCSs to a greater extent than objective cancer-related variables.

Limitations

The inclusion of a validated generic QoL questionnaire, the large sample size, and the large range in time since treatment are strengths in the design of this study. However, this study has some limitations as well. First of all, the response rate of 50% may have induced bias, although the participating TCSs did not differ in age, time since diagnosis, and type of treatment from those who did not participate. Matsuda et al. [19] have summarized several characteristics of nonresponders, and gender was one of them. Men tend to have a lower response rate than women, so this might partly explain the relatively low response rate in the present study. A further limitation was that chronic disease was measured somewhat crudely: respondents were not asked to indicate their perception of the severity of the chronic disease and whether they thought that the chronic disease was a consequence of the treatment for TC. Finally, based on a previous report [5], we decided to dichotomize employment status into employment for wages and not employed for wages. The last group included students as well as retirees, and this may have resulted in a biased picture of the results. However, we also performed analyses with other dichot-

omizations (for example, dichotomizations in which students and/or retirees were left out), and this did not give different results (not reported in the results section).

Summary and conclusions

In conclusion, the results of the present study show that, on the whole, TCSs experience a QoL similar to that of men who did not experience cancer. Age, employment status, chronic disease, and negative life events were more important determinants of QoL than objective disease characteristics and should be taken into account when considering the QoL of TCSs over time. TCSs who are not employed for wages and who have a chronic disease seemed to be at risk for an impaired functioning. Finally, it should be noted that the amount of variance explained by sociodemographic variables, life events, and cancer-related variables was small, indicating that more important predictors remain to be identified.

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References

1. Arai Y, Kawakita M, Hida S, Terachi T, Okada Y, Yoshida O (1996) Psychosocial aspects in long-term survivors of testicular cancer. J Urol 155:574–578
2. Bardwell WA, Major JM, Rock CL, Newman VA, Thomson CA, Chilton JA, Dimsdale JE, Pierce JP (2004) Health-related quality of life in women previously treated for early-stage breast cancer. Psycho-Oncol
3. Bjordal K, Mastekaasa A, Kaasa S (1995) Self-reported satisfaction with life and physical health in long-term cancer survivors and a matched control group. Eur J Cancer B Oral Oncol 31B:340–345
4. Bosl GJ, Motzer RJ (1997) Testicular germ-cell cancer. N Engl J Med 337:242–253
5. Brazier JE, Harper R, Jones NMB, O'Cathain A, Thomas KJ, Usherwood T, Westlake L (1992) Validating the SF-36 health survey questionnaire: new outcome measure for primary care. BMJ 305:160–164
6. Caffo O, Amichetti M, Tomio L, Galligioni E (2001) Quality of life after radiotherapy for early-stage testicular seminoma. Radiother Oncol 59:13–20
7. Cohen J (1988) Statistical power analysis for the behavioral sciences. Erlbaum, Hillsdale, NJ
8. Dearnaley D, Huddart R, Horwich A (2001) Regular review: managing testicular cancer. BMJ 322:1583–1588
9. Efficace F, Bottomley A, Osoba D, Gotay C, Flechtner H, D'haese S, Zurlo A (2003) Beyond the development of health-related quality-of-life (HRQOL) measures: a checklist for evaluating HRQOL outcomes in cancer clinical trials—Does HRQOL evaluation in prostate cancer research inform clinical decision making? J Clin Oncol 21:3502–3511
10. Festinger L (1957) A theory of cognitive dissonance. New York
11. Fleer J, Hoekstra HJ, Sleijfer DT, Hoekstra-Weebers JEHM (2004) Quality of life of survivors of testicular germ cell cancer: a review of the literature. Support Care Cancer 12:476–486
12. Forehand R, Biggar H, Kotchick BA (1998) Cumulative risk across family stressors: short- and long-term effects for adolescents. J Abnorm Child Psychol 26:119–128
13. Fossa SD, Dahl AA, Loge JH (2003) Fatigue, anxiety, and depression in long-term survivors of testicular cancer. J Clin Oncol 21:1249–1254
14. Ganz PA, Rowland JH, Desmond K, Meyerowitz BE, Wyatt GE (1998) Life after breast cancer: understanding women's health-related quality of life and sexual functioning. J Clin Oncol 16:501–514
15. Gotay CC, Muraoka MY (1998) Quality of life in long-term survivors of adult-onset cancers. J Natl Cancer Inst 90:656–667
16. Greaves-Otte JG, Greaves J, Kruyt PM, van Leeuwen O, van der Wouden JC, van der DE (1991) Problems at social re-integration of long-term cancer survivors. Eur J Cancer 27:178–181
17. Hays RD, Donald Sherbourne C, Mazel RM (1993) The RAND 36-item health survey 1.0. Health Econ 2:217–227
18. Joly F, Heron JF, Kalusinski L, Bottet P, Brune D, Allouache N, Mace-Lesec'h J, Couette JE, Peny J, Henry-Amar M (2002) Quality of life in long-term survivors of testicular cancer: a population-based case-control study. J Clin Oncol 20:73–80
19. Matsuda T, Marche H, Grosclaude P, Clement S (2004) Participation behavior of bladder cancer survivors in a medical follow-up survey on quality of life in France. Eur J Epidemiol 19: 313–321
20. Meinardi MT, Gietema JA, van der Graaf WT, van Veldhuisen DJ, Runne MA, Sluiter WJ, de Vries EG, Willemse PB, Mulder NH, van den Berg MP, Koops HS, Sleijfer DT (2000) Cardiovascular morbidity in long-term survivors of metastatic testicular cancer. J Clin Oncol 18:1725–1732
21. Michelson H, Bolund C, Brandberg Y (2000) Multiple chronic health problems are negatively associated with health related quality of life (HRQoL) irrespective of age. Qual Life Res 9:1093–1104
22. Michelson H, Bolund C, Nilsson B, Brandberg Y (2000) Health-related quality of life measured by the EORTC QLQ-C30: reference values from a large sample of the Swedish population. Acta Oncol 39:477–484
23. Parker PA, Baile WF, Moor CC, Cohen L (2003) Psychosocial and demographic predictors of quality of life in a large sample of cancer patients. Psycho-Oncol 12:183–193
24. Rudberg L, Nilsson S, Wikblad K (2000) Health-related quality of life in survivors of testicular cancer 3 to 13 years after treatment. J Psychosoc Oncol 18:19–31
25. Schlenk EA, Erlen JA, Dunbar-Jacob J, McDowell J, Engberg S, Sereika SM, Rohay JM, Bernier MJ (1998) Health-related quality of life in chronic disorders: a comparison across studies using the MOS SF-36. Qual Life Res 7:57–65
26. Schnoll RA, Harlow LL (2001) Using disease-related and demographic variables to form cancer-distress risk groups. J Behav Med 24:57–74
27. Sprangers MA, Schwartz CE (1999) Integrating response shift into health-related quality of life research: a theoretical model. Soc Sci Med 48:1507–1515

28. Travis LB, Curtis RE, Storm H, Hall P, Holowaty E, Van Leeuwen FE, Kohler BA, Pukkala E, Lynch CF, Andersson M, Bergfeldt K, Clarke EA, Wiklund T, Stoter G, Gospodarowicz M, Sturgeon J, Fraumeni JF Jr, Boice JD Jr (1997) Risk of second malignant neoplasms among long-term survivors of testicular cancer. J Natl Cancer Inst 89: 1429–1439
29. Van de Willige G, Schreurs P, Tellegen B, Zwart F (1985) Het meten van 'life events': de Vragenlijst Recent Meegemaakte Gebeurtenissen (VRMG). Nederlands Tijdschrift voor de Psychologie 40:1–19
30. Van der Zee KI, Sanderman, R (1993) The measurement of generic health with the RAND-36. Northern Centre for Healthcare Research. http://www.coo.med.rug.nl.nch. Cited 14 Apr 2005
31. Vidrine DJ, Gritz ER (2003) Psychosocial outcomes after testicular cancer treatment. In: Steele Jr GD, Phillips TL, Chabner BA, Gansler TS (eds) Germ cell tumors—American Cancer Society atlas of clinical oncology. BC Decker Inc., Hamilton, London, pp 295–305
32. Wingard JR, Curbow B, Baker F, Piantadosi S (1991) Health, functional status, and employment of adult survivors of bone-marrow transplantation. Ann Intern Med 114:113–118
33. Zebrack BJ, Chesler M (2001) Health-related worries, self-image, and life outlooks of long-term survivors of childhood cancer. Health Soc. Work 26:245–256